REDUCTION OF A CENTURY OF TEMPERATURE OBSERVATIONS TOHOMOGENIETY.

By ERIC R. MILLER.

[Presented before the American Meteorological Society at Chicago, Dec. 29, 1920.]

[Author's abstract.]

A table of monthly mean temperatures from October, 1819, to date has been prepared for Madison, Wis. Of these, 59 years 8 months are derived from observations actually made at Madison. The period from October, 1819, to December, 1873, is covered by data from stations in Wisconsin and adjoining states at which observations were made by the Army Medical Corps, Smithsonian observers, and others.

The Madison data have been corrected to the mean of 24 hourly observations. The other data have in addition corrections for reduction to Madison. These corrections were obtained from recent observations.

The aggregate length of record from the 17 neighboring stations used is 283 years 10 months, and gives from one to nine estimates of the mean temperature for each month.

Comparison of these estimates with one another and with observations at Madison, when available show that single estimates may differ 5° or 6°, but that the mean of four or five estimates is within 2½° F.

The comparisons also show that the Smithsonian and Army thermometers were exposed to the sun at some stations. The influence of exposure nearer the ground than in Weather Bureau offices of the present day is also plainly evident. Only one case, of serious instrumental error was detected among the 18 stations considered. Many typographical errors in printed tables were found.

THE INVESTIGATION OF GRAVITY AT SEA.

Students of both geodesy and meteorology will be interested in the note in *Nature* for February 3, 1921 (pp. 732–734), by Prof. W. G. Duffield, giving a brief résumé of the difficulties of determining the value of gravity at sea and the results of such efforts.

It is gratifying to note the statement at the close of the article to the effect that the causes of errors are engaging the attention of those who are contemplating a fresh attack upon the problem.

In this connection the writer wishes to repeat a suggestion he first made more than a year ago, that one of the engines employed in warfare may be made to serve an excellent purpose in the investigations of gravity at sea, namely, the submarine. It would seem that this boat, riding a short distance below the surface of the water, would furnish a very suitable station in midocean at which observations of gravity could be made with the greatest possible deliberation and entirely free from some of the sources of disturbance and errors that can not be avoided in the case of vessels riding on the surface.

The details by which observations could be obtained by means of the submarine and the possibilities of such investigations furnish a fruitful subject for study and development.—*C. F. Marvin.*

NOTES, ABSTRACTS, AND REVIEWS.

ELECTRIC-OSCILLATION ANEMOMETER.[1]

By E. ROTHE.

[Reprinted from *Science Abstracts*, Sect. A, November, 1920, §1376.]

In cloudy or foggy weather, when observations of the upper winds by pilot balloons are impossible, an electric contact anemometer may be raised by balloon or kite, but this necessitates a double wire with the consequent additional weight to lift. The author outlines a method of using only a single wire, the cable of the balloon or kite. The anemometer is made to act as an interrupter, putting into action, at each contact, an instrument which sets up electric oscillation in the wire. These are received at the surface by a "wireless" receiving set. The velocity of the wind is deducible in the ordinary way from the frequency of the contacts. Several anemometers may be attached to the cable at different heights, each instrument emitting waves of a different length, so that any particular one may be made to register by suitably tuning the receiver at the surface. Extension might be made to other meteorological elements, and a complete "observatory" could then be raised and made to record at the surface by a single wire.—*M. A. G.*

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VARIATION OF THE INDICATIONS OF ROBINSON AND RICHARD ANEMOMETERS WITH THE INCLINATION OF THE WIND.[2]

By C. E. BRAZIER.

[Reprinted from *Science Abstracts*, 1920, §1041.]

Robinson and Richard anemometers have been exposed, in an aerodynamical laboratory, to wind currents of known velocity making various angles with the normal position in which the instrument is used, and some preliminary results are noted in this paper. The number of revolutions per second (n) in the normal position is found to be related to the wind velocity (V) by a relation of the form $V=A+Bn$ for the Robinson anemometer and $n=aV+bV^2+cV^3$ for the Richard. The term in V^3 may be omitted by reducing the size of the Richard instrument. If the instruments are inclined to their normal position at angles up to 30° it is found sufficient to modify the above relations, expressed in the form $n=\phi(V)$, simply by multiplying $\phi(V)$ by a factor. For an inclination of 30° the factors found are 1.1 for the Robinson anemometer and 0.8 for the Richard. The experiments show that, for a given wind velocity, the variation in the velocity of rotation is not a simple function of the inclination of the instrument to the normal position, and the effect of increasing the inclination up to 90° is shown by an example for each instrument. A description is added of the effect of exposing an element of a Robinson anemometer (2 cups only) in the normal position to a stream of air velocity 5 m./sec. Four positions of equilibrium are found, two stable and two unstable. Commencing with a position of stable equilibrium and increasing the velocity of the air, the system after oscillating finally rotates continuously in the ordinary sense.—*M. A. G.*

DISCUSSION.

This note is important in that it indicates a method of determining true velocities from anemometers carried by kites or airplanes whose position may change more or less with reference to the wind, and from anemometers of the "windmill" type (such as Richard's) when they are oriented by vanes of different lengths.

[1] *Comptes Rendus*, May 17, 1920, 170:1197–1198.
[2] *Comptes Rendus*, Mar. 8, 1920, pp. 610–612.

A few comparisons with results obtained by other experimenters will be of interest:

W. H. Dines (1889–1893)[1] found (1) that the pressure on a flat plate decreased very little when the angle changed from normal (0°) to 45°; (2) that a self-adjusting helicoid anemometer was slightly affected by changes of direction while an air meter was considerably affected, both instruments underregistering in a wind of variable direction; (3), a pressure-tube anemometer was not affected by changes of 15° to 20° from a mean direction.

Experiments at Blue Hill Observatory (1892–93)[2] showed that "windmill" anemometers carried by vanes 80 to 120 centimeters in length recorded correctly at low and moderate velocities (below 10 m./s.) but under-registered at an increasing ratio at higher velocities, the deficiency amounting to about 20 per cent at 30 m./s. The same anemometers, on wide vanes 30 to 50 centimeters in length, recorded correctly at all velocities.

Prof. Marvin (1899)[3], while testing Robinson anemometers on a whirling machine, found that the indications of a kite anemometer making one rotation for each meter of wind were not seriously affected when the axis of the instrument deviated continuously as much as 20° from the vertical, the average of several experiments being about 4 per cent, or practically within the usual range of variation found among anemometers of the Robinson type under similar conditions.

Further results of this work are awaited with interest.—*S. P. Fergusson.*

BRIGHTNESS OF THE UNCLOUDED SKY.[4]

By M. UIBE.

[Reprinted from *Science Abstracts*, Sect. A, November, 1920, §1410.]

Describes a form of portable photometer designed for comparing the brightness of different parts of the sky. The two parts to be compared illuminate a photometer of the Lummer-Brodhun contrast type, and equality of brightness in the photometer is obtained by varying the thickness of a layer of liquid placed in the path of one of the beams of light. This liquid consists of an aniline neutral grey solution, but for light reductions of large ratio gray glasses are employed. The author has used the apparatus for determining the distribution of brightness of the clear sky as seen from a height of some 3,000 meters in Teneriffe.—*J. W. T. W.*

SPECTROPHOTOMETRY OF SKY LIGHT.[5]

By D. PACINI.

[Reprinted from *Science Abstracts*, Sect. A, December, 1920, §1552.]

Described a prolonged spectrophotometric study of the light from the sky under various conditions, as seen from Sestola (1090 meters above sea-level). The observations were made with a photometer employing an acetylene flame as standard. Curves are given for the relative intensities throughout the visible spectrum for the light from the zenith and various parts of the sky, at different times of day from dawn onwards, and under conditions of cloudiness, misty and dull. The light was found to be selective, having a decided preponderance of blue. It also appears that a very pronounced reduction in the extreme violet is associated with the condensation of aqueous vapor.—*J. W. T. W.*

COLOR AND POLARIZATION OF SKY LIGHT.[6]

By A. GOCKEL.

[Reprinted from *Science Abstracts*, Sect. A, November, 1920, §1377.]

Using a polarimeter fitted with Wratten filters, the polarization of the light from the sky is investigated for various parts of the spectrum. The intensity of the light was also measured after each observation of polarization. In the paper the results and methods of other authors are fully discussed, but the writer's own results are chiefly that on a clear atmosphere the differences in the polarization of individual colors are smaller than the errors of observation. With increasing turbidity, however, the polarization in the short wave lengths exceeds that in the long, but where, through diffraction, little or no blue can originate, as in the neighborhood of the sun and in a damp layer, the excess is with the long wave part of the spectrum.—*M. A. G.*

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RELATION BETWEEN THE ABSORPTION OF SOLAR RADIATION BY THE ATMOSPHERE AND THE POLARIZATION OF DIFFUSE SKY LIGHT.[7]

By A. BOUTARIC.

[Reprinted from *Science Abstracts*, Sect. A, Dec. 1920, § 1539.]

Finds that corresponding to an increase in the absorption of solar radiation by the atmosphere there is a corresponding decrease in the proportion of diffuse skylight polarized. The result is based on observations made at Montpellier on cloudless days, using the compensation pyrheliometer of K. Ångström and a Cornu polarimeter. Observations of humidity at the surface were also made on the same days. The portion of the sky chosen for the polarimetric observations was that 90° from the sun in the same vertical circle, this being the region of maximum polarization. The result was verified for observations (1) on the same day, comparing observations at time symmetrically placed with respect to noon; (2) on days close together, comparing observations at the same hour of the day; (3) on days belonging to different months, comparing observations at times corresponding to an equal thickness of atmosphere traversed by the solar radiation; (4) for corresponding days of different years. If on two occasions the conditions as to humidity are very different there may be an apparent exception, since this affects the observed intensity of radiation, but not the polarization. Further, in (3) a small correction is necessary for the effect on the intensity of radiation of the varying distance of the earth from the sun. It is suggested that there is a relation appropriate to a given station and possibly the same for all stations of the same altitude, of the form $I=f(d, t, P, f)$, where I is the intensity of solar radiation received at the earth's surface, d the distance of the sun from the earth, t the thickness of atmosphere traversed by the solar radiation, P the polarization, and f the vapor pressure in the air. t and P are of greater importance than d and f. In a further part the relation between absorption of direct and polarization of scattered radiation is studied as a laboratory experiment.—*M. A. G.*

[1] *Quarterly Journal, Royal Met. Socy*, various papers, 1889-1893 and *Proc. Royal Society*, vols. 48 and 50.
[2] *Annals*, Harvard College Obsy., vol. XL, Pt. IV, 1896.
[3] MONTHLY WEATHER REVIEW, February, 1900.
[4] Sachs. Akad. Wiss. Abhandl., Math. Phys. Klasse., 1918, 35:219.
[5] Soc. Spettros. Ital., Mem. 8, July-August, 1920, pp. 62-79.
[6] Ann. d. Physik, June 8, 1920, 62:283-292.
[7] Jour. de Physique, July, 1920, v. 9, pp. 239-256.